Site Number:

Sample Number:

Field Record Sheet

Water Bug (sensitivity rating)	
Very Sensitive Bugs	***Number of Bugs Found***
Stonefly Nymph (10)	
Mayfly Nymph (9)	
Sensitive Bugs	***Number of Bugs Found***
Alderfly Larva (8)	
Caddisfly Larva (8)	
Water Mite (6)	
Tolerant Bugs	***Number of Bugs Found***
Beetle Larva (5)	
Dragonfly Nymph (4)	
Water Strider (4)	
Whirligig Beetle and Larva (4)	
Freshwater Yabby/Crayfish (4)	
Damselfly Nymph (3)	
Fly Larva and Pupa (3)	
Midge Larva and Pupa (3)	
Freshwater Mussel (3)	
Nematode (3)	
Freshwater Sandhopper (3)	
Freshwater Shrimp (3)	
Water Scorpion/Needle Bug (3)	
Very Tolerant	***Number of Bugs Found***
Diving Beetle (2)	
Flatworm (2)	
Hydra (2)	
Water Treader (2)	
Freshwater Slater (2)	
Water Boatman (2)	
Freshwater Boatman (2)	
Freshwater Worm (2)	
Backswimmer (1)	
Bloodworm (1)	
Leech (1)	
Mosquito Larva/Pupa (1)	
Freshwater Snail (1)	

Weight Factor Table	
Number of each bug found (column B)	Weight Factor (Column C)
1 to 2	1
3 to 5	2
6 to 10	3
11 to 20	4
More than 20	5

Data Processing

Site Number: **1**

Sample Number: **1**

	A	B	C	D
Bug Type	**Sensitivity Rating**	**Number of Bugs Found**	**Weight Factor**	**Column A x Column C**
Very Sensitive Bugs				
Stonefly Nymph	10	7	3	30
Mayfly Nymph	9	2	1	9
Sensitive Bugs				
Water Mite	6	1	1	6
Tolerant Bugs				
Water Strider	4	2	1	4
Damselfly Nymph	3	1	1	3
Freshwater Shrimp	3	1	1	3
Water Scorpion/Needle Bug	3	2	1	3
Very Tolerant Bugs				
Diving Beetle	2	1	1	2
Freshwater Slater	2	1	1	2
		Totals	11	62

Stream Pollution Index (SPI):

$$\frac{\text{Total of Column D}}{\text{Total of Column C}} = \frac{62}{11}$$

=5.6, which is good

What Your SPI Score Means:	
Stream Pollution Index	**Stream Quality Rating**
Less than 3	= Poor
3 to 4	= Fair
4 to 6	= Good
More than 6	= Excellent

Weight Factor Table	
Number of each bug found (column B)	Weight Factor (Column C)
1 to 2	1
3 to 5	2
6 to 10	3
11 to 20	4
More than 20	5

Data Processing

Site Number: **1**

Sample Number: **2**

	A	B	C	D
Bug Type	**Sensitivity Rating**	**Number of Bugs Found**	**Weight Factor**	**Column A x Column C**
Very Sensitive Bugs				
Stonefly Nymph	10	3	2	20
Mayfly Nymph	9	1	1	9
Sensitive Bugs				
Water Mite	6	1	1	6
Tolerant Bugs				
Damselfly Nymph	3	1	1	3
Water Scorpion/Needle Bug	3	1	1	3
Very Tolerant Bugs				
Freshwater Snail	1	14	4	4
		Totals	10	45

Stream Pollution Index (SPI):

$$\frac{\text{Total of Column D}}{\text{Total of Column C}}$$

$$= \frac{45}{10}$$

=4.5, which is good

What Your SPI Score Means:	
Stream Pollution Index	**Stream Quality Rating**
Less than 3	= Poor
3 to 4	= Fair
4 to 6	= Good
More than 6	= Excellent

Weight Factor Table	
Number of each bug found (column B)	Weight Factor (Column C)
1 to 2	1
3 to 5	2
6 to 10	3
11 to 20	4
More than 20	5

Data Processing

Site Number: **2**

Sample Number: **1**

	A	B	C	D
Bug Type	**Sensitivity Rating**	**Number of Bugs Found**	**Weight Factor**	**Column A x Column C**
Very Sensitive Bugs				
Mayfly Nymph	9	1	1	9
Tolerant Bugs				
Beetle Larva	5	1	1	5
Freshwater Shrimp	3	1	1	3
Very Tolerant Bugs				
Freshwater Snail	1	7	3	3
		Totals	6	20

Stream Pollution Index (SPI):

$$\frac{\text{Total of Column D}}{\text{Total of Column C}}$$

$$= \frac{20}{6}$$

=3.3, which is fair

What Your SPI Score Means:	
Stream Pollution Index	**Stream Quality Rating**
Less than 3	= Poor
3 to 4	= Fair
4 to 6	= Good
More than 6	= Excellent

Weight Factor Table	
Number of each bug found (column B)	Weight Factor (Column C)
1 to 2	1
3 to 5	2
6 to 10	3
11 to 20	4
More than 20	5

Data Processing

Site Number: **2**

Sample Number: **2**

	A	B	C	D
Bug Type	**Sensitivity Rating**	**Number of Bugs Found**	**Weight Factor**	**Column A x Column C**
Sensitive Bugs				
Alderfly Larva	8	6	3	24
Water Mite	6	1	1	6
Tolerant Bugs				
Freshwater Shrimp	5	1	1	5
Very Tolerant Bugs				
Freshwater Snail	1	8	3	3
		Totals	8	38

Stream Pollution Index (SPI):

$$\frac{\text{Total of Column D}}{\text{Total of Column C}}$$

$$= \frac{38}{8}$$

=4.8, which is good

What Your SPI Score Means:	
Stream Pollution Index	**Stream Quality Rating**
Less than 3	= Poor
3 to 4	= Fair
4 to 6	= Good
More than 6	= Excellent

Weight Factor Table	
Number of each bug found (column B)	Weight Factor (Column C)
1 to 2	1
3 to 5	2
6 to 10	3
11 to 20	4
More than 20	5

Data Processing

Site Number: **3**

Sample Number: **1**

	A	B	C	D
Bug Type	**Sensitivity Rating**	**Number of Bugs Found**	**Weight Factor**	**Column A x Column C**
Very Tolerant Bugs				
Hydra	2	1	1	2
Bloodworm	1	3	2	2
Mosquito Larva/Pupa	1	1	1	1
Freshwater Snail	1	5	2	2
		Totals	6	7

Stream Pollution Index (SPI):

$$\frac{\text{Total of Column D}}{\text{Total of Column C}}$$

$$= \frac{7}{6}$$

=1.2, which is poor

What Your SPI Score Means:	
Stream Pollution Index	**Stream Quality Rating**
Less than 3	= Poor
3 to 4	= Fair
4 to 6	= Good
More than 6	= Excellent

Weight Factor Table	
Number of each bug found (column B)	Weight Factor (Column C)
1 to 2	1
3 to 5	2
6 to 10	3
11 to 20	4
More than 20	5

Data Processing

Site Number: **3**

Sample Number: **2**

	A	B	C	D
Bug Type	**Sensitivity Rating**	**Number of Bugs Found**	**Weight Factor**	**Column A x Column C**
Very Tolerant Bugs				
Bloodworm	1	1	1	1
Mosquito Larva/Pupa	1	2	1	1
		Totals	2	2

Stream Pollution Index (SPI):

$$\frac{\text{Total of Column D}}{\text{Total of Column C}}$$

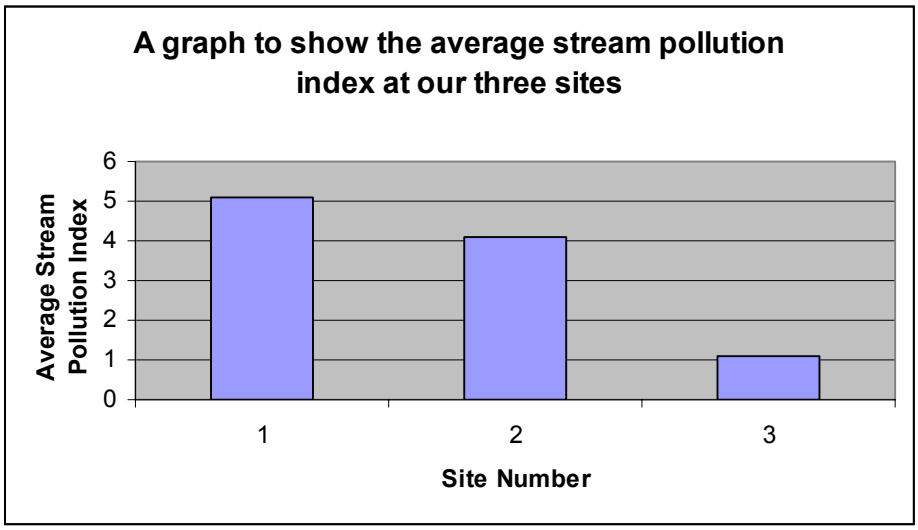
$$= \frac{2}{2}$$

=1, which is poor

What Your SPI Score Means:	
Stream Pollution Index	**Stream Quality Rating**
Less than 3	= Poor
3 to 4	= Fair
4 to 6	= Good
More than 6	= Excellent

Table showing the average of the stream pollution index for each site

Site #	Sample #	Site Pollution Index	Average	Quality Rating
1	1	5.6		
	2	4.5	5.1	Good
2	1	3.3		
	2	4.8	4.1	Fair
3	1	1.1		
	2	1	1.1	Poor



10

Conclusion

In conclusion to this experiment on pollution, the results show that the stream in Tai Po Kau is much cleaner at the top and more polluted at the bottom. To test this, we used the Biotic Index to determine the amount of pollution there is in the stream. The Biotic Index is a formula using living organisms, which can be used to judge the level of pollution. The experiment begins near the top of the stream, which is where site 1 is located, and as we go further down the stream, the population of the sensitive bugs decline. The decline of the sensitive bugs is an indication of an increase in pollution because sensitive bugs are sensitive to pollution, therefore the more pollution there is, the less amount of sensitive bugs in that area. The results satisfy the hypothesis because the level of pollution had been expected to increase as the area of the stream becomes further from the top. However, the dramatic difference in pollution is quite surprising because I had expected only a slight amount of change between site 1 and site 3. This is because Tai Po Kau is more of a rural area and not a lot of farming takes place around the area. Nonetheless, the results show a dramatic change between pollution at site 1 and pollution at site 3.

Evaluation

Samples were first taken by using the Kick Sampling Method. However, the method was unsuccessful and so we switched to using the Rock Sampling Method instead. Samples were taken by picking up rocks at a certain area and rinsing them in a tray of water to wash out the organisms. The problem with the Rock Sampling Method, however, is that the amount and size of the rocks cannot be the same and they would not have been picked out randomly because the rocks were hand picked and therefore we might have had the tendency to pick up smaller/larger/smoother rocks. An example of such a difficulty is when my group reached site 3. Site 3 contained much more broken down rocks and therefore we only tried to gather the larger rocks and ignored the smaller rocks. This could distort the results because organisms living on the smaller rocks would not be recorded, and the fact that we are *choosing* which rocks to examine makes it a selective sampling instead of a random one. Also, the flow rates of each site were not the same because the flow rate wasn't even measured. This is a very important flaw because different flow rates determine where different organisms choose to live. Some organisms are adapted to living in fast flow rates and others in slow, so if samples were taken at areas with different flow rates, then the results would be distorted because instead of pollution being the cause of a decline in organisms, it could be that the flow rates affected their presence. Another weakness is the *time* that the samples were taken at. This includes both the time of the year, and the time of the day. Because what we did is a spot check, the results cannot be very accurate since time of day and year are crucial to the presence of certain organisms because many of them are r-strategists therefore they have breeding cycles and therefore their population increases and decreases dramatically at different times. Lastly, the biotic index that are used are not based on Hong Kong. Instead, the keys that were used are based on Europe or North America. This is a very important weakness because the keys are not specialized just for Hong Kong and therefore cannot assess the level of pollution because the Hong Kong environment is extremely different from the environment in Europe or North America. Although there are many weaknesses to this type of method, there are many strengths as well. This type of method is very quick and easy to calculate and is easy to understand by both specialists and non-specialists. If I were to do this investigation again, I would probably do replicas at different times of the day and year. This way, the results would be more accurate because it takes seasonal changes into consideration and since there are replicas, there is less likely to be any errors.